Goddard Procedures and Guidelines

DIRECTIVE NO. GPG 8700.2
EFFECTIVE DATE:
EXPIRATION DATE:

APPROVED BY Signature:
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TITLE: Director

Responsible Office: 500/Applied Engineering and Technology Development

Title: DESIGN DEVELOPMENT

Preface

P1. PURPOSE

This procedure establishes the process for providing design input, for generating design output and associated design verification, and for handling design changes that occur as the result of design review and/or modifications to the Customer Agreement (see GPG 1310.1).

P2. APPLICABILITY

This procedure applies to the development of all GSFC products and processes covered by the scope of the GSFC Quality Management System (see GPD 1270.3).

P3. AUTHORITY

GPD 1270.3, GSFC Quality Management System (QMS)

P4. REFERENCES

a. GPG 1310.1, Customer Agreements

b. GPG 1440.7, Control of Quality Records

c. GPG 8700.1, Design Planning and Interface Management

d. GPG 8700.3, Design Validation

e. GPG 8700.4, Technical Review Program

P5. CANCELLATION

a. GMI 1710.4, Design, Inspection and Certification of Pressure Vessels and Pressurized Systems

b. GMI 5330.6, Implementation of the GSFC Parts Program

c. GMI 8040.1, Configuration Management

d. GMI 8070.1, GSFC's Policy Relating to Standards for Aerospace Data Systems

Procedure

1. DEFINITIONS

a. Design Verification - In design development, verification is the process of examining the resulting design to determine conformity with the documented requirements. Examples include (1) the review of documentation prior to release; (2) performing alternate calculations to verify the original analysis; and (3) physical tests of hardware and operational tests of software.

b. Configuration – Functional and physical characteristics of a product as defined in design documents and achieved in the product.

c. Configuration Baseline – Configuration of a product, formally established at a specific point in time, which serves as a reference for further activities.

d. Configuration Control Board – A team of individuals responsible for establishing and maintaining the Configuration Baseline.

e. Configuration Documents – Documents that define requirements, design, build/production, and validation of a product.

f. Configuration Item – Hardware, software, processed materials, services, or any discrete portions thereof, designated for configuration management and treated as a single entity in the configuration management process.

g. Product Design Lead (PDL) - The manager or leader with overall responsibility for managing the design activity, managing the technical and organizational interfaces identified during design planning, and where required, forming and leading the Product Design Team (PDT). The term refers to flight project managers, mission managers, instrument managers, subsystem technical managers, integrated product development team leaders, lead engineers, etc.

2. IMPLEMENTATION

Note: The following paragraphs describe the design flow process which is also illustrated by the attached flow diagram. The Design Plan represents the input for design development.

2.1 The PDL convenes the PDT to review the Customer Agreement (see GPG 1310.1) and the Design Plan (see GPG 8700.1), review the scope of the product design, document derived requirements (including relevant statutory and regulatory requirements) as design input, and develop detailed product design schedules as necessary.

2.1.1 If, as the result of GPG 8700.3, corrective action is needed, the PDT performs additional design development activities.

2.2 The PDT performs the necessary design activities to meet the requirements of the Customer Agreement and the Design Plan. The PDL maintains product descriptions, configuration management records, analyses, reports, instructions, and test results as quality records in accordance with GPG 1440.7.

2.2.3 The PDT documents the design output in terms that can be verified against design requirements. Design output consists of drawings, specifications, and/or procedures necessary to develop and/or operate the product. Design output shall include acceptance criteria for product validation, and identify those characteristics that are essential to the safe and proper functioning of the product (see GPG 8700.3).

2.2.4 The PDT shall conduct and document design verification activities as necessary, such as:

a. Drawing Checking
b. Finite Element Analysis
c. Breadboard/Prototype Tests
d. Software Code Walk-Throughs
e. Mathematical Simulations

2.3 Product Configuration Control

Each GSFC Directorate responsible for management of product design shall prepare a Directorate level procedure(s) addressing configuration control. The Directorate shall determine the organizational level (e.g., Directorate, Divisional, Branch, Project) at which configuration control procedures are required. Configuration control procedures shall describe the following configuration management processes, as a minimum:

a. Configuration Control Board (CCB)
    1. Membership
    2. Change approval authorities

b. Selection and identification of items requiring configuration control (configuration items), including the criteria for determining such selection

c. Identification (e.g., numbering) conventions to be applied to configuration items

d. Establishment of configuration baselines

e. Identification, documentation, and evaluation of change requests, including identification of change requests requiring customer approval.

f. Documentation of change approvals, including effectivity considerations. If “red-line” change approval capability is desired, associated documentation, authorities, and limitations shall be addressed.

g. Implementation and verification of changes

h. Configuration management procedures for subcontractor designs

2.3.1 The PDT ensures that design changes are controlled and documented in accordance with applicable configuration control procedures.

Whenever the design fails to meet requirements, the PDL develops change recommendations in accordance with the applicable configuration management plan.

2.4 The PDL/PDT prepares and presents documentation for design reviews (see GPG 8700.4).

3. RECORDS

a. Configuration Management Records per applicable Configuration Management Plan

b. Design Schedules

c. Product Descriptions

d. Design Analyses

Design Development Flowchart

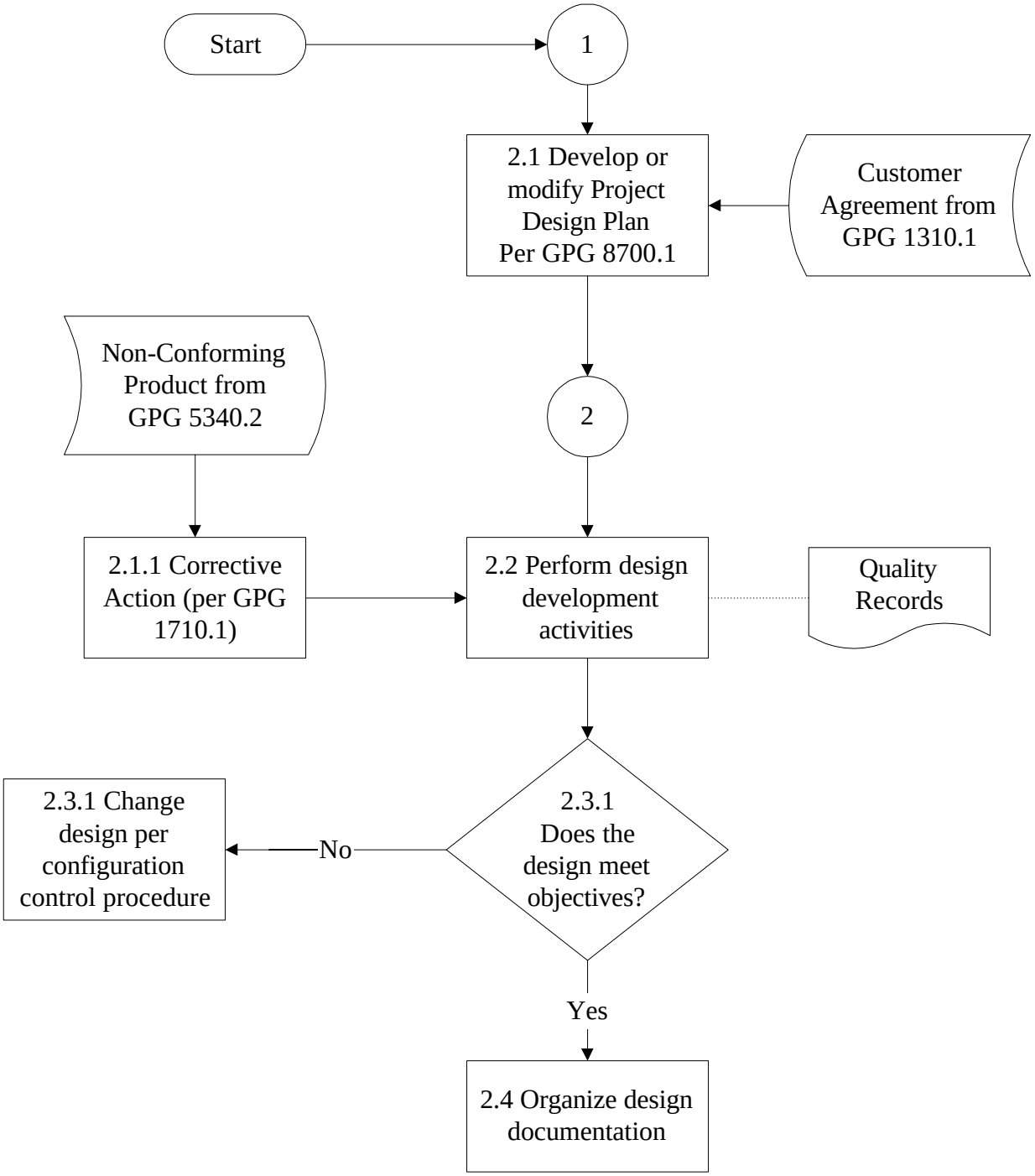

Figure 1